

## SEQUENCE LISTING

<110> Van Mellaert, Herman

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Van Rie, Jeroen

Joos, Henk

<120> RECOMBINANT PLANT EXPRESSING NON-COMPETITIVELY BINDING Bt  
INSECTICIDAL CRYSTAL PROTEINS

<130> 021565-078

<140> Div of 09/176,320

<141> Even date herewith

<150> PCT/EP90/00905

<151> 1990-05-30

<150> GB 89401499.2

<151> 1989-05-31

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ttcatatgct ttaaattgta gtaaagaaaa acagtacaaa cttaaagga cttagtaat 240

ttaataaaaa aaggggatag ttt atg gaa ata aat aat caa aac caa tgt gtg 293

Met Glu Ile Asn Asn Gln Asn Gln Cys Val

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cct tac aat tgt tta agt aat cct aag gag ata ata tta ggc gag gaa 341

Pro Tyr Asn Cys Leu Ser Asn Pro Lys Glu Ile Ile Leu Gly Glu Glu

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agg cta gaa aca ggg aat act gta gca gac att tca tta ggg ctt att 389

Arg Leu Glu Thr Gly Asn Thr Val Ala Asp Ile Ser Leu Gly Leu Ile

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aat ttt cta tat tct aat ttt gta cca gga gga gga ttt ata gta ggt 437

Asn Phe Leu Tyr Ser Asn Phe Val Pro Gly Gly Gly Phe Ile Val Gly

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tta cta gaa tta ata tgg gga ttt ata ggg cct tcg caa tgg gat att 485

Leu Leu Glu Leu Ile Trp Gly Phe Ile Gly Pro Ser Gln Trp Asp Ile

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ttt tta gct caa att gag caa ttg att agt caa aga ata gaa gaa ttt 533

Phe Leu Ala Gln Ile Glu Gln Leu Ile Ser Gln Arg Ile Glu Glu Phe

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gct agg aat cag gca att tca aga ttg gag ggg cta agc aat ctt tat 581

Ala Arg Asn Gln Ala Ile Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr

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aag gtc tat gtt aga gcg ttt agc gac tgg gag aaa gat cct act aat 629

Lys Val Tyr Val Arg Ala Phe Ser Asp Trp Glu Lys Asp Pro Thr Asn

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cct gct tta agg gaa gaa atg cgt ata caa ttt aat gac atg aat agt 677

Pro Ala Leu Arg Glu Glu Met Arg Ile Gln Phe Asn Asp Met Asn Ser

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get ctt tta tct gta tat gtt caa gcc gca aac tta cat tta tct att 773

Ala Leu Leu Ser Val Tyr Val Gln Ala Ala Asn Leu His Leu Ser Ile

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tta agg gat gtt tca gtt ttc gga gaa aga tgg gga tat gat aca gcg 821

Leu Arg Asp Val Ser Val Phe Gly Glu Arg Trp Gly Tyr Asp Thr Ala

175                    180                    185

act atc aat aat cgc tat agt gat ctg act agc ctt att cat gtt tat 869

Thr Ile Asn Asn Arg Tyr Ser Asp Leu Thr Ser Leu Ile His Val Tyr

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act aac cat tgt gtg gat acg tat aat cag gga tta agg cgt ttg gaa 917

Thr Asn His Cys Val Asp Thr Tyr Asn Gln Gly Leu Arg Arg Leu Glu

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ggt cgt ttt ctt agc gat tgg att gta tat aat cgt ttc cgg aga caa 965

Gly Arg Phe Leu Ser Asp Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln

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ttg aca att tca gta tta gat att gtt gcg ttt ttt cca aat tat gat 1013

Leu Thr Ile Ser Val Leu Asp Ile Val Ala Phe Phe Pro Asn Tyr Asp

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att aga aca tat cca att caa aca gct act cag cta acg agg gaa gtc 1061

Ile Arg Thr Tyr Pro Ile Gln Thr Ala Thr Gln Leu Thr Arg Glu Val

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tat ctg gat tta cct ttt att aat caa aat ctt tct cct gca gca agc 1109

Tyr Leu Asp Leu Pro Phe Ile Asn Gln Asn Leu Ser Pro Ala Ala Ser

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tat cca acc ttt tca gct gct gaa agt gct ata att aga agt cct cat 1157

Tyr Pro Thr Phe Ser Ala Ala Glu Ser Ala Ile Ile Arg Ser Pro His

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tta gta gac ttt tta aat agc ttt acc att tat aca gat agt ctg gca 1205

Leu Val Asp Phe Leu Asn Ser Phe Thr Ile Tyr Thr Asp Ser Leu Ala

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cgt tat gca tat tgg gga ggg cac ttg gta aat tct ttc cgc aca gga 1253

Arg Tyr Ala Tyr Trp Gly Gly His Leu Val Asn Ser Phe Arg Thr Gly

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acc act act aat ttg ata aga tcc cct tta tat gga agg gaa gga aat 1301

Thr Thr Thr Asn Leu Ile Arg Ser Pro Leu Tyr Gly Arg Glu Gly Asn

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aca gag cgc ccc gta act att acc gca tca cct agc gta cca ata ttt 1349

Thr Glu Arg Pro Val Thr Ile Thr Ala Ser Pro Ser Val Pro Ile Phe

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aga aca ctt tca tat att aca ggc ctt gac aat tca aat cct gta gct 1397

Arg Thr Leu Ser Tyr Ile Thr Gly Leu Asp Asn Ser Asn Pro Val Ala

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gga atc gag gga gtg gaa ttc caa aat act ata agt aga agt atc tat 1445

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cgt aaa agc ggt cca ata gat tct ttt agt gaa tta cca cct caa gat 1493

Arg Lys Ser Gly Pro Ile Asp Ser Phe Ser Glu Leu Pro Pro Gln Asp

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Ala Ser Val Ser Pro Ala Ile Gly Tyr Ser His Arg Leu Cys His Ala



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aca ttt tta gaa cgg att agt gga cca aga ata gca ggc acc gta ttt 1589

Thr Phe Leu Glu Arg Ile Ser Gly Pro Arg Ile Ala Gly Thr Val Phe

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aga att aca caa att cca tgg gta aag gcg cat act ctt gca tct ggt 1685

Arg Ile Thr Gln Ile Pro Trp Val Lys Ala His Thr Leu Ala Ser Gly

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gcc tcc gtc att aaa ggt cct gga ttt aca ggt gga gat att ctg act 1733

Ala Ser Val Ile Lys Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr

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agg aat agt atg ggc gag ctg ggg acc tta cga gta acc ttc aca gga 1781

Arg Asn Ser Met Gly Glu Leu Gly Thr Leu Arg Val Thr Phe Thr Gly

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Arg Leu Pro Gln Ser Tyr Tyr Ile Arg Phe Arg Tyr Ala Ser Val Ala

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aat agg agt ggt aca ttt aga tat tca cag cca cct tcg tat gga att 1877

Asn Arg Ser Gly Thr Phe Arg Tyr Ser Gln Pro Pro Ser Tyr Gly Ile

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tca ttt cca aaa act atg gac gca ggt gaa cca cta aca tct cgt tcg 1925

Ser Phe Pro Lys Thr Met Asp Ala Gly Glu Pro Leu Thr Ser Arg Ser

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gaa gaa ttt gat cta tac atc caa tcg ggt gtt tat ata gat cga att 2021

Glu Glu Phe Asp Leu Tyr Ile Gln Ser Gly Val Tyr Ile Asp Arg Ile

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gaa ttt ata ccg gtt act gca aca ttt gag gca gaa tat gat tta gaa 2069

Glu Phe Ile Pro Val Thr Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu

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SCANNED

aga gcg caa aag gtg gtg aat gcc ctg ttt acg tct aca aac caa cta 2117

Arg Ala Gln Lys Val Val Asn Ala Leu Phe Thr Ser Thr Asn Gln Leu

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cta gtt gcg tgt tta tcg gat gaa ttt tgt ctg gat gaa aag aga gaa 2213

Leu Val Ala Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys Arg Glu

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ttg tcc gag aaa gtt aaa cat gca aag cga ctc agt gat gag cgg aat 2261

Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu Arg Asn

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Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro Asp Arg

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Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp Asp Val

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ttc aaa gag aat tac gtt acg cta ccg ggt acc ttt gat gag tgc tat 2405

Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr

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cca acg tat tta tat caa aaa ata gat gag tcg aaa tta aaa gcc tat 2453

Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys Ala Tyr

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acc cgt tat caa tta aga ggg tat atc gaa gat agt caa gac tta gaa 2501

Thr Arg Tyr Gln Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu

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atc tat tta att cgt tac aat gca aaa cac gaa ata gta aat gta cca 2549

Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn Val Pro

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Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn Pro Asp

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tta cac tgt tcc tgc aga gac ggg gaa aaa tgt gca cat cat tct cat 2693

Leu His Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His Ser His

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cat ttc tct ttg gac att gat gtt gga tgt aca gac tta aat gag gac 2741

His Phe Ser Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn Glu Asp

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tta ggt gta tgg gtg ata ttc aag att aag acg caa gat ggc cac gca 2789

Leu Gly Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Gly His Ala

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cga cta ggg aat cta gag ttt ctc gaa gag aaa cca tta tta gga gaa 2837

Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu

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gca cta gct cgt gtg aaa aga gcg gag aaa aaa tgg aga gac aaa cgc 2885

Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg

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Glu Thr Leu Gln Leu Glu Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu

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Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val His Arg

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Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly Val Asn

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gcg gct att ttt gaa gaa tta gaa gag cgt att ttc act gca ttt tcc 3125

Ala Ala Ile Phe Glu Glu Leu Glu Glu Arg Ile Phe Thr Ala Phe Ser

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cta tat gat gcg aga aat att att aaa aat ggc gat ttc aat aat ggc 3173

Leu Tyr Asp Ala Arg Asn Ile Ile Lys Asn Gly Asp Phe Asn Asn Gly

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aat cac cgt tca gtc ctg gtt atc cca gaa tgg gag gca gaa gtg tca 3269

Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu Val Ser

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caa gag gtt cgt gtc tgt cca ggt cgt ggc tat atc ctt cgt gtt aca 3317

Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr

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gga gaa aca gaa gga aca ttc atc gtg gac agc gtg gaa tta ctc ctt 3749

Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu Leu



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atg gag gaa tag gaccatccga gtatagcagt ttaataaata ttaattaaaa 3801

Met Glu Glu

1165

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20

25

30

Thr Val Ala Asp Ile Ser Leu Gly Leu Ile Asn Phe Leu Tyr Ser Asn

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Phe Val Pro Gly Gly Gly Phe Ile Val Gly Leu Leu Glu Leu Ile Trp

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Gly Phe Ile Gly Pro Ser Gln Trp Asp Ile Phe Leu Ala Gln Ile Glu

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Gln Leu Ile Ser Gln Arg Ile Glu Glu Phe Ala Arg Asn Gln Ala Ile

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90

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Ser Arg Leu Glu Gly Leu Ser Asn Leu Tyr Lys Val Tyr Val Arg Ala

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110

Phe Ser Asp Trp Glu Lys Asp Pro Thr Asn Pro Ala Leu Arg Glu Glu

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Met Arg Ile Gln Phe Asn Asp Met Asn Ser Ala Leu Ile Thr Ala Ile

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Pro Leu Phe Arg Val Gln Asn Tyr Glu Val Ala Leu Leu Ser Val Tyr

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Val Gln Ala Ala Asn Leu His Leu Ser Ile Leu Arg Asp Val Ser Val

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Phe Gly Glu Arg Trp Gly Tyr Asp Thr Ala Thr Ile Asn Asn Arg Tyr

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Ser Asp Leu Thr Ser Leu Ile His Val Tyr Thr Asn His Cys Val Asp

195

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Thr Tyr Asn Gln Gly Leu Arg Arg Leu Glu Gly Arg Phe Leu Ser Asp

210

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Trp Ile Val Tyr Asn Arg Phe Arg Arg Gln Leu Thr Ile Ser Val Leu

225

230

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Asp Ile Val Ala Phe Phe Pro Asn Tyr Asp Ile Arg Thr Tyr Pro Ile

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Gln Thr Ala Thr Gln Leu Thr Arg Glu Val Tyr Leu Asp Leu Pro Phe

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265

270

Ile Asn Gln Asn Leu Ser Pro Ala Ala Ser Tyr Pro Thr Phe Ser Ala

275

280

285

Ala Glu Ser Ala Ile Ile Arg Ser Pro His Leu Val Asp Phe Leu Asn

290

295

300

Ser Phe Thr Ile Tyr Thr Asp Ser Leu Ala Arg Tyr Ala Tyr Trp Gly

305

310

315

320

Gly His Leu Val Asn Ser Phe Arg Thr Gly Thr Thr Thr Asn Leu Ile

325

330

335

Arg Ser Pro Leu Tyr Gly Arg Glu Gly Asn Thr Glu Arg Pro Val Thr

340

345

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Ile Thr Ala Ser Pro Ser Val Pro Ile Phe Arg Thr Leu Ser Tyr Ile

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Thr Gly Leu Asp Asn Ser Asn Pro Val Ala Gly Ile Glu Gly Val Glu

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Phe Gln Asn Thr Ile Ser Arg Ser Ile Tyr Arg Lys Ser Gly Pro Ile

385

390

395

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Asp Ser Phe Ser Glu Leu Pro Pro Gln Asp Ala Ser Val Ser Pro Ala

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410

415

Ile Gly Tyr Ser His Arg Leu Cys His Ala Thr Phe Leu Glu Arg Ile

420

425

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Ser Gly Pro Arg Ile Ala Gly Thr Val Phe Ser Trp Thr His Arg Ser

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Ala Ser Pro Thr Asn Glu Val Ser Pro Ser Arg Ile Thr Gln Ile Pro

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455

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Trp Val Lys Ala His Thr Leu Ala Ser Gly Ala Ser Val Ile Lys Gly

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Pro Gly Phe Thr Gly Gly Asp Ile Leu Thr Arg Asn Ser Met Gly Glu

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Leu Gly Thr Leu Arg Val Thr Phe Thr Gly Arg Leu Pro Gln Ser Tyr

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Tyr Ile Arg Phe Arg Tyr Ala Ser Val Ala Asn Arg Ser Gly Thr Phe

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Arg Tyr Ser Gln Pro Pro Ser Tyr Gly Ile Ser Phe Pro Lys Thr Met

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Asp Ala Gly Glu Pro Leu Thr Ser Arg Ser Phe Ala His Thr Thr Leu

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Phe Thr Pro Ile Thr Phe Ser Arg Ala Gln Glu Glu Phe Asp Leu Tyr

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Ile Gln Ser Gly Val Tyr Ile Asp Arg Ile Glu Phe Ile Pro Val Thr

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Ala Thr Phe Glu Ala Glu Tyr Asp Leu Glu Arg Ala Gln Lys Val Val

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His Ala Lys Arg Leu Ser Asp Glu Arg Asn Leu Leu Gln Asp Pro Asn

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Phe Arg Gly Ile Asn Arg Gln Pro Asp Arg Gly Trp Arg Gly Ser Thr

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Asp Ile Thr Ile Gln Gly Gly Asp Asp Val Phe Lys Glu Asn Tyr Val

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Thr Leu Pro Gly Thr Phe Asp Glu Cys Tyr Pro Thr Tyr Leu Tyr Gln

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Lys Ile Asp Glu Ser Lys Leu Lys Ala Tyr Thr Arg Tyr Gln Leu Arg

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Gly Tyr Ile Glu Asp Ser Gln Asp Leu Glu Ile Tyr Leu Ile Arg Tyr

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Asn Ala Lys His Glu Ile Val Asn Val Pro Gly Thr Gly Ser Leu Trp

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Pro Leu Ser Val Glu Asn Gln Ile Gly Pro Cys Gly Glu Pro Asn Arg

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Cys Ala Pro His Leu Glu Trp Asn Pro Asp Leu His Cys Ser Cys Arg

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795

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Asp Gly Glu Lys Cys Ala His His Ser His His Phe Ser Leu Asp Ile

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810

815

Asp Val Gly Cys Thr Asp Leu Asn Glu Asp Leu Gly Val Trp Val Ile

820

825

830

Phe Lys Ile Lys Thr Gln Asp Gly His Ala Arg Leu Gly Asn Leu Glu

835

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845

Phe Leu Glu Glu Lys Pro Leu Leu Gly Glu Ala Leu Ala Arg Val Lys

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Arg Ala Glu Lys Lys Trp Arg Asp Lys Arg Glu Thr Leu Gln Leu Glu

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Thr Thr Ile Val Tyr Lys Glu Ala Lys Glu Ser Val Asp Ala Leu Phe

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Val Asn Ser Gln Tyr Asp Arg Leu Gln Ala Asp Thr Asn Ile Ala Met

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Ile His Ala Ala Asp Lys Arg Val His Arg Ile Arg Glu Ala Tyr Leu

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Pro Glu Leu Ser Val Ile Pro Gly Val Asn Ala Ala Ile Phe Glu Glu

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1005

Pro Gly Arg Gly Tyr Ile Leu Arg Val Thr Ala Tyr Lys Glu Gly Tyr

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Val Thr Cys Ile Asn Tyr Thr Ala Thr Gln Glu Glu Tyr Glu Gly Thr

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Ser Val Pro Ala Asp Tyr Ala Ser Val Tyr Glu Glu Lys Ser Tyr Thr

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tacgtttttt gtattttttc ataagatgtg tcatatgtat taaatcgtgg taatgaaaaa 180

cagtatcaaa ctatcagaac ttgtagtt taataaaaaa acggaggtat ttt atg 236

Met

1

gag gaa aat aat caa aat caa tgc ata cct tac aat tgt tta agt aat 284

Glu Glu Asn Asn Gln Asn Gln Cys Ile Pro Tyr Asn Cys Leu Ser Asn

5 10 15

cct gaa gaa gta ctt ttg gat gga gaa cgg ata tca act ggt aat tca 332

Pro Glu Glu Val Leu Leu Asp Gly Glu Arg Ile Ser Thr Gly Asn Ser

20 25 30

tca att gat att tct ctg tca ctt gtt cag ttt atg gta tct aac ttt 380

Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Met Val Ser Asn Phe

35 40 45

gta cca ggg gga gga ttt tta gtt gga tta ata gat ttt gta tgg gga 428

Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp Gly

50 55 60 65

ata gtt ggc cct tct caa tgg gat gca ttt cta gta caa att gaa caa 476

Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu Gln

70 75 80

tta att aat gaa aga ata gct gaa ttt gct agg aat gct gct att gct 524

Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile Ala

85

90

95

aat tta gaa gga tta gaa aac aat tta aat ata tat gtg gaa gca ttt 572

Asn Leu Glu Gly Leu Glu Asn Asn Leu Asn Ile Tyr Val Glu Ala Phe

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105

110

aaa gaa tgg gaa gaa gat cct aat aat cca gaa acc agg acc aga gta 620

Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Glu Thr Arg Thr Arg Val

115

120

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att gat cgc ttt cgt ata ctt gat ggg cta ctt gaa agg gac att cct 668

Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile Pro

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140

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tcg ttt cga att tct gga ttt gaa gta ccc ctt tta tcc gtt tat gct 716

Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr Ala

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caa gcg gcc aat ctg cat cta gct ata tta aga gat tct gta att ttt 764

Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile Phe

165

170

175

gga gaa aga tgg gga ttg aca acg ata aat gtc aat gaa aac tat aat 812

Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr Asn

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185

190

aga cta att agg cat att gat gaa tat gct gat cac tgt gca aat acg 860

Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn Thr

195

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tat aat cgg gga tta aat aat tta ccg aaa tct acg tat caa gat tgg 908

Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp Trp

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215

220

225

ata aca tat aat cga tta cgg aga gac tta aca ttg act gta tta gat 956

Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu Asp

230

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atc gcc gct ttc ttt cca aac tat gac aat agg aga tat cca att cag 1004

Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile Gln

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cca gtt ggt caa cta aca agg gaa gtt tat acg gac cca tta att aat 1052

Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile Asn

260 265 270

ttt aat cca cag tta cag tct gta gct caa tta cct act ttt aac gtt 1100

Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn Val

275 280 285

atg gag agc agc gca att aga aat cct cat tta ttt gat ata ttg aat 1148

Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu Asn

290 295 300 305

aat ctt aca atc ttt acg gat tgg ttt agt gtt gga cgc aat ttt tat 1196

Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe Tyr

310 315 320

tgg gga gga cat cga gta ata tct agc ctt ata gga ggt ggt aac ata 1244

Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn Ile

325 330 335

aca tct cct ata tat gga aga gag gcg aac cag gag cct cca aga tcc 1292

Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg Ser

340 345 350

ttt act ttt aat gga ccg gta ttt agg act tta tca aat cct act tta 1340

Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr Leu

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365

cga tta tta cag caa cct tgg cca gcg cca cca ttt aat tta cgt ggt 1388

Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg Gly

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375

380

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gtt gaa gga gta gaa ttt tct aca cct aca aat agc ttt acg tat cga 1436

Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr Arg

390

395

400

gga aga ggt acg gtt gat tct tta act gaa tta ccg cct gag gat aat 1484

Gly Arg Gly Thr Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp Asn

405

410

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agt gtg cca cct cgc gaa gga tat agt cat cgt tta tgt cat gca act 1532

Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala Thr

420

425

430

ttt gtt caa aga tct gga aca cct ttt tta aca act ggt gta gta ttt 1580

Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val Phe

435

440

445



tct tgg acg cat cgt agt gca act ctt aca aat aca att gat cca gag 1628

Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro Glu

450 455 460 465

aga att aat caa ata cct tta gtg aaa gga ttt aga gtt tgg ggg ggc 1676

Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly Gly

470 475 480

acc tct gtc att aca gga cca gga ttt aca gga ggg gat atc ctt cga 1724

Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu Arg

485 490 495

aga aat acc ttt ggt gat ttt gta tct cta caa gtc aat att aat tca 1772

Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn Ser

500 505 510

cca att acc caa aga tac cgt tta aga ttt cgt tac gct tcc agt agg 1820

Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser Arg

515 520 525

gat gca cga gtt ata gta tta aca gga gcg gca tcc aca gga gtg gga 1868

Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val Gly

530

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ggc caa gtt agt gta aat atg cct ctt cag aaa act atg gaa ata ggg 1916

Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile Gly

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gag aac tta aca tct aga aca ttt aga tat acc gat ttt agt aat cct 1964

Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn Pro

565

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ttt tca ttt aga gct aat cca gat ata att ggg ata agt gaa caa cct 2012

Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln Pro

580

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cta ttt ggt gca ggt tct att agt agc ggt gaa ctt tat ata gat aaa 2060

Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp Lys

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600

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att gaa att att cta gca gat gca aca ttt gaa gca gaa tct gat tta 2108

Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp Leu

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gaa aga gca caa aag gcg gtg aat gcc ctg ttt act tct tcc aat caa 2156

Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn Gln

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atc ggg tta aaa acc gat gtg acg gat tat cat att gat caa gta tcc 2204

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645

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aat tta gtg gat tgt tta tca gat gaa ttt tgt ctg gat gaa aag cga 2252

Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys Arg

660

665

670

gaa ttg tcc gag aaa gtc aaa cat gcg aag cga ctc agt gat gag cgg 2300

Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu Arg

675

680

685

aat tta ctt caa gat cca aac ttc aga ggg atc aat aga caa cca gac 2348

Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro Asp

690

695

700

705

cgt ggc tgg aga gga agt aca gat att acc atc caa gga gga gat gac 2396

Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp Asp

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gta ttc aaa gag aat tac gtc aca cta ccg ggt acc gtt gat gag tgc 2444

Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu Cys

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tat cca acg tat tta tat cag aaa ata gat gag tcg aaa tta aaa gct 2492

Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys Ala

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tat acc cgt tat gaa tta aga ggg tat atc gaa gat agt caa gac tta 2540

Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp Leu

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760

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gaa atc tat ttg atc cgt tac aat gca aaa cac gaa ata gta aat gtg 2588

Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn Val

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775

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785

cca ggc acg ggt tcc tta tgg ccg ctt tca gcc caa agt cca atc gga 2636

Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile Gly

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795

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aag tgt gga gaa ccg aat cga tgc gcg cca cac ctt gaa tgg aat cct 2684

Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn Pro

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810

815

gat cta gat tgt tcc tgc aga gac ggg gaa aaa tgt gca cat cat tcc 2732

Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His Ser

820

825

830

cat cat ttc acc ttg gat att gat gtt gga tgt aca gac tta aat gag 2780

His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn Glu

835

840

845

gac tta ggt gta tgg gtg ata ttc aag att aag acg caa gat ggc cat 2828

Asp Leu Gly Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Gly His

850

855

860

865

gca aga cta ggg aat cta gag ttt ctc gaa gag aaa cca tta tta ggg 2876

Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu Gly

870

875

880

gaa gca cta gct cgt gtg aaa aga gcg gag aag aag tgg aga gac aaa 2924

Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp Lys

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890

895

cga gag aaa ctg cag ttg gaa aca aat att gtt tat aaa gag gca aaa 2972

Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala Lys

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905

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gaa tct gta gat gct tta ttt gta aac tct caa tat gat aga tta caa 3020

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915

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925

gtg gat acg aac atc gcg atg att cat gcg gca gat aaa cgc gtt cat 3068

Val Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val His

930

935

940

945

aga atc cgg gaa gcg tat ctg cca gag ttg tct gtg att cca ggt gtc 3116

Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly Val

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Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala Tyr

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tcc tta tat gat gcg aga aat gtc att aaa aat ggc gat ttc aat aat 3212

Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn Asn

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985

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ggc tta tta tgc tgg aac gtg aaa ggt cat gta gat gta gaa gag caa 3260

Gly Leu Leu Cys Trp Asn Val Lys Gly His Val Asp Val Glu Glu Gln

995 1000 1005

aac aac cac cgt tgc gtc ctt gtt atc cca gaa tgg gag gca gaa gtg 3308

Asn Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu Val

1010 1015 1020 1025

tca caa gag gtt cgt gtc tgt cca ggt cgt ggc tat atc ctt cgt gtc 3356

Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg Val

1030 1035 1040

aca gca tat aaa gag gga tat gga gag ggc tgc gta acg atc cat gag 3404

Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val Thr Ile His Glu

1045 1050 1055

atc gaa gac aat aca gac gaa ctg aaa ttc agc aac tgt gta gaa gag 3452

Ile Glu Asp Asn Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu Glu

1060 1065 1070

gaa gta tat cca aac aac aca gta acg tgt aat aat tat act ggg act 3500

Glu Val Tyr Pro Asn Asn Thr Val Thr Cys Asn Asn Tyr Thr Gly Thr

1075 1080 1085

caa gaa gaa tat gag ggt acg tac act tct cgt aat caa gga tat gac 3548

Gln Glu Glu Tyr Glu Gly Thr Tyr Thr Ser Arg Asn Gln Gly Tyr Asp

1090 1095 1100 1105

gaa gcc tat ggt aat aac cct tcc gta cca gct gat tac gct tca gtc 3596

Glu Ala Tyr Gly Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser Val

1110 1115 1120

tat gaa gaa aaa tcg tat aca gat gga cga aga gag aat cct tgt gaa 3644

Tyr Glu Glu Lys Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys Glu

1125 1130 1135

tct aac aga ggc tat ggg gat tac aca cca cta ccg gct ggt tat gta 3692

Ser Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr Val

1140 1145 1150

aca aag gat tta gag tac ttc cca gag acc gat aag gta tgg att gag 3740

Thr Lys Asp Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile Glu

1155 1160 1165

atc gga gaa aca gaa gga aca ttc atc gtg gat agc gtg gaa tta ctc 3788

Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu Leu

1170 1175 1180 1185



ctt atg gag gaa taa gatacgttat aaaatgtaac gtatgcaaataaagaatgat 3843

Leu Met Glu Glu

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ctcttaagag aatgatgtcc

3923

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<211> 1189

<212> PRT

<213> Bacillus thuringiensis

<400> 8

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Asn Pro Glu Glu Val Leu Leu Asp Gly Glu Arg Ile Ser Thr Gly Asn

20

25

30

Ser Ser Ile Asp Ile Ser Leu Ser Leu Val Gln Phe Met Val Ser Asn

35

40

45

Phe Val Pro Gly Gly Gly Phe Leu Val Gly Leu Ile Asp Phe Val Trp

50

55

60

Gly Ile Val Gly Pro Ser Gln Trp Asp Ala Phe Leu Val Gln Ile Glu

65

70

75

80

Gln Leu Ile Asn Glu Arg Ile Ala Glu Phe Ala Arg Asn Ala Ala Ile

85

90

95

Ala Asn Leu Glu Gly Leu Glu Asn Asn Leu Asn Ile Tyr Val Glu Ala

100

105

110

Phe Lys Glu Trp Glu Glu Asp Pro Asn Asn Pro Glu Thr Arg Thr Arg

115

120

125

Val Ile Asp Arg Phe Arg Ile Leu Asp Gly Leu Leu Glu Arg Asp Ile

130

135

140

Pro Ser Phe Arg Ile Ser Gly Phe Glu Val Pro Leu Leu Ser Val Tyr

145

150

155

160

Ala Gln Ala Ala Asn Leu His Leu Ala Ile Leu Arg Asp Ser Val Ile

165

170

175

Phe Gly Glu Arg Trp Gly Leu Thr Thr Ile Asn Val Asn Glu Asn Tyr

180

185

190

Asn Arg Leu Ile Arg His Ile Asp Glu Tyr Ala Asp His Cys Ala Asn

195

200

205

Thr Tyr Asn Arg Gly Leu Asn Asn Leu Pro Lys Ser Thr Tyr Gln Asp

210

215

220

Trp Ile Thr Tyr Asn Arg Leu Arg Arg Asp Leu Thr Leu Thr Val Leu

225

230

235

240

Asp Ile Ala Ala Phe Phe Pro Asn Tyr Asp Asn Arg Arg Tyr Pro Ile

245

250

255

Gln Pro Val Gly Gln Leu Thr Arg Glu Val Tyr Thr Asp Pro Leu Ile

260

265

270

Asn Phe Asn Pro Gln Leu Gln Ser Val Ala Gln Leu Pro Thr Phe Asn

275

280

285

Val Met Glu Ser Ser Ala Ile Arg Asn Pro His Leu Phe Asp Ile Leu

290

295

300

Asn Asn Leu Thr Ile Phe Thr Asp Trp Phe Ser Val Gly Arg Asn Phe

305

310

315

320

Tyr Trp Gly Gly His Arg Val Ile Ser Ser Leu Ile Gly Gly Gly Asn

325

330

335

Ile Thr Ser Pro Ile Tyr Gly Arg Glu Ala Asn Gln Glu Pro Pro Arg

340

345

350

Ser Phe Thr Phe Asn Gly Pro Val Phe Arg Thr Leu Ser Asn Pro Thr

355

360

365

Leu Arg Leu Leu Gln Gln Pro Trp Pro Ala Pro Pro Phe Asn Leu Arg

370

375

380

Gly Val Glu Gly Val Glu Phe Ser Thr Pro Thr Asn Ser Phe Thr Tyr

385

390

395

400

Arg Gly Arg Gly Thr Val Asp Ser Leu Thr Glu Leu Pro Pro Glu Asp

405

410

415

Asn Ser Val Pro Pro Arg Glu Gly Tyr Ser His Arg Leu Cys His Ala

420

425

430

Thr Phe Val Gln Arg Ser Gly Thr Pro Phe Leu Thr Thr Gly Val Val

435

440

445

Phe Ser Trp Thr His Arg Ser Ala Thr Leu Thr Asn Thr Ile Asp Pro

450

455

460

Glu Arg Ile Asn Gln Ile Pro Leu Val Lys Gly Phe Arg Val Trp Gly

465

470

475

480

Gly Thr Ser Val Ile Thr Gly Pro Gly Phe Thr Gly Gly Asp Ile Leu

485

490

495

Arg Arg Asn Thr Phe Gly Asp Phe Val Ser Leu Gln Val Asn Ile Asn

500

505

510

Ser Pro Ile Thr Gln Arg Tyr Arg Leu Arg Phe Arg Tyr Ala Ser Ser

515

520

525

Arg Asp Ala Arg Val Ile Val Leu Thr Gly Ala Ala Ser Thr Gly Val

530

535

540

Gly Gly Gln Val Ser Val Asn Met Pro Leu Gln Lys Thr Met Glu Ile

545

550

555

560

Gly Glu Asn Leu Thr Ser Arg Thr Phe Arg Tyr Thr Asp Phe Ser Asn

565

570

575

Pro Phe Ser Phe Arg Ala Asn Pro Asp Ile Ile Gly Ile Ser Glu Gln

580

585

590

Pro Leu Phe Gly Ala Gly Ser Ile Ser Ser Gly Glu Leu Tyr Ile Asp

595

600

605

Lys Ile Glu Ile Ile Leu Ala Asp Ala Thr Phe Glu Ala Glu Ser Asp

610

615

620

Leu Glu Arg Ala Gln Lys Ala Val Asn Ala Leu Phe Thr Ser Ser Asn

625

630

635

640

Gln Ile Gly Leu Lys Thr Asp Val Thr Asp Tyr His Ile Asp Gln Val

645

650

655

Ser Asn Leu Val Asp Cys Leu Ser Asp Glu Phe Cys Leu Asp Glu Lys

660

665

670

Arg Glu Leu Ser Glu Lys Val Lys His Ala Lys Arg Leu Ser Asp Glu

675

680

685

Arg Asn Leu Leu Gln Asp Pro Asn Phe Arg Gly Ile Asn Arg Gln Pro

690

695

700

Asp Arg Gly Trp Arg Gly Ser Thr Asp Ile Thr Ile Gln Gly Gly Asp

705

710

715

720

Asp Val Phe Lys Glu Asn Tyr Val Thr Leu Pro Gly Thr Val Asp Glu

725

730

735

Cys Tyr Pro Thr Tyr Leu Tyr Gln Lys Ile Asp Glu Ser Lys Leu Lys

740

745

750

Ala Tyr Thr Arg Tyr Glu Leu Arg Gly Tyr Ile Glu Asp Ser Gln Asp

755

760

765

Leu Glu Ile Tyr Leu Ile Arg Tyr Asn Ala Lys His Glu Ile Val Asn

770

775

780

Val Pro Gly Thr Gly Ser Leu Trp Pro Leu Ser Ala Gln Ser Pro Ile

785

790

795

800

Gly Lys Cys Gly Glu Pro Asn Arg Cys Ala Pro His Leu Glu Trp Asn

805

810

815

Pro Asp Leu Asp Cys Ser Cys Arg Asp Gly Glu Lys Cys Ala His His

820

825

830

Ser His His Phe Thr Leu Asp Ile Asp Val Gly Cys Thr Asp Leu Asn

835

840

845

Glu Asp Leu Gly Val Trp Val Ile Phe Lys Ile Lys Thr Gln Asp Gly

850

855

860

His Ala Arg Leu Gly Asn Leu Glu Phe Leu Glu Glu Lys Pro Leu Leu

865

870

875

880

Gly Glu Ala Leu Ala Arg Val Lys Arg Ala Glu Lys Lys Trp Arg Asp

885

890

895



Lys Arg Glu Lys Leu Gln Leu Glu Thr Asn Ile Val Tyr Lys Glu Ala

900

905

910

Lys Glu Ser Val Asp Ala Leu Phe Val Asn Ser Gln Tyr Asp Arg Leu

915

920

925

Gln Val Asp Thr Asn Ile Ala Met Ile His Ala Ala Asp Lys Arg Val

930

935

940

His Arg Ile Arg Glu Ala Tyr Leu Pro Glu Leu Ser Val Ile Pro Gly

945

950

955

960

Val Asn Ala Ala Ile Phe Glu Glu Leu Glu Gly Arg Ile Phe Thr Ala

965

970

975

Tyr Ser Leu Tyr Asp Ala Arg Asn Val Ile Lys Asn Gly Asp Phe Asn

980

985

990

Asn Gly Leu Leu Cys Trp Asn Val Lys Gly His Val Asp Val Glu Glu

995

1000

1005

Gln Asn Asn His Arg Ser Val Leu Val Ile Pro Glu Trp Glu Ala Glu

1010

1015

1020

Val Ser Gln Glu Val Arg Val Cys Pro Gly Arg Gly Tyr Ile Leu Arg

025                    1030                    1035                    1040

Val Thr Ala Tyr Lys Glu Gly Tyr Gly Glu Gly Cys Val Thr Ile His

1045                    1050                    1055

Glu Ile Glu Asp Asn Thr Asp Glu Leu Lys Phe Ser Asn Cys Val Glu

1060                    1065                    1070

Glu Glu Val Tyr Pro Asn Asn Thr Val Thr Cys Asn Asn Tyr Thr Gly

1075                    1080                    1085

Thr Gln Glu Glu Tyr Glu Gly Thr Tyr Thr Ser Arg Asn Gln Gly Tyr

1090                    1095                    1100

Asp Glu Ala Tyr Gly Asn Asn Pro Ser Val Pro Ala Asp Tyr Ala Ser

105                    1110                    1115                    1120

Val Tyr Glu Glu Lys Ser Tyr Thr Asp Gly Arg Arg Glu Asn Pro Cys

1125                    1130                    1135

Glu Ser Asn Arg Gly Tyr Gly Asp Tyr Thr Pro Leu Pro Ala Gly Tyr

1140

1145

1150

Val Thr Lys Asp Leu Glu Tyr Phe Pro Glu Thr Asp Lys Val Trp Ile

1155

1160

1165

Glu Ile Gly Glu Thr Glu Gly Thr Phe Ile Val Asp Ser Val Glu Leu

1170

1175

1180

Leu Leu Met Glu Glu

185